Great Lakes Ballast Water Collaborative

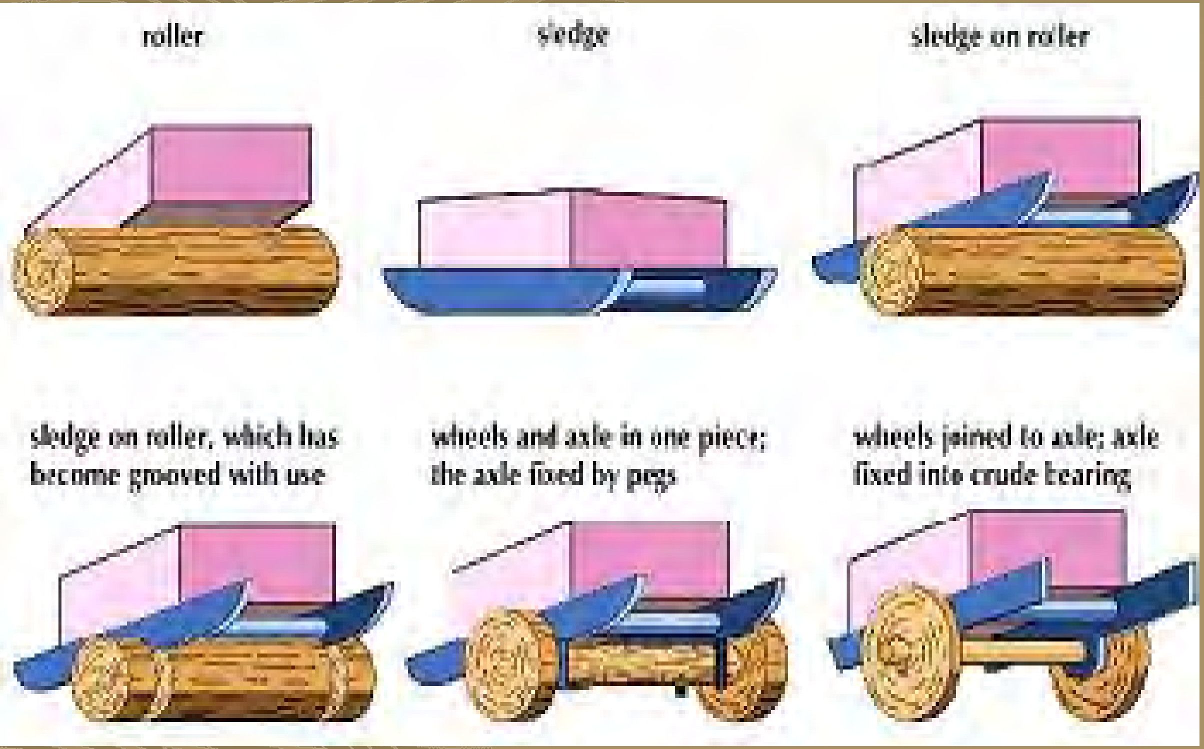
January 2011

National Park Service
U.S. Department of the Interior

EXPERIENCE YOUR AMERICA

Moving water to meet our needs

Before the wheel: sledges & skids



Attributed Mechanisms of Introduction of Non-Native Species in Lake Superior or Tributaries (1883-2010)

Mechanisms of Introduction	Number of Species	Percent of Introduction*
Ship's ballast	40	43%
Cultivation	19	20%
Diseases and Parasites with Introduced Fish	13	14%
Stocked Fish	5	5%
Unknown	5	5%
Canals and Diversions	5	5%
Aquarium Releases	3	3%
Live Bait Releases by Anglers	3	3%
Recreational Boaters	2	2%
Railroads and Highways	1	1%
Packaging "Hitchhiker"	1	1%

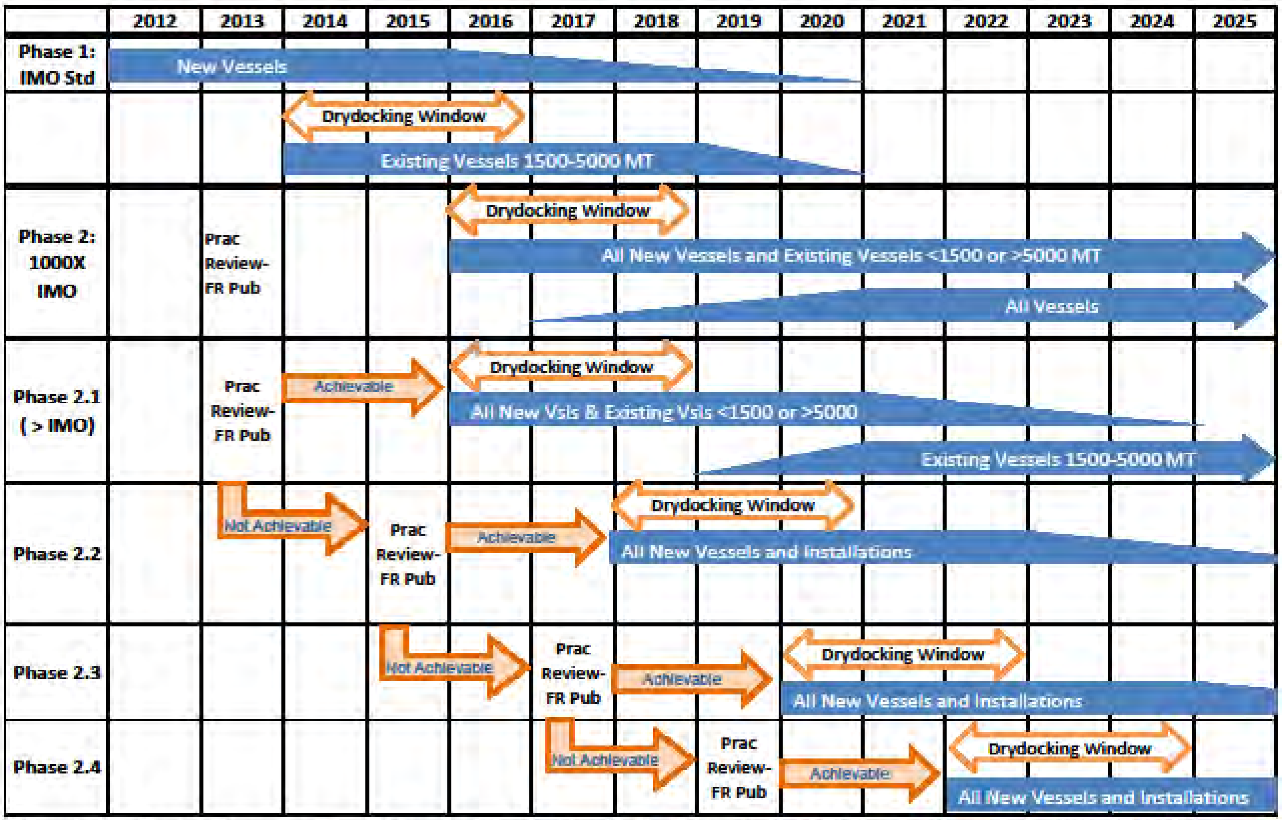
Jensen, DA & Gunderson, JL. 2010. Soon available at www.seagrant.umn.edu

Sea Grant

[redacted]

Revised: 28 Aug 2009

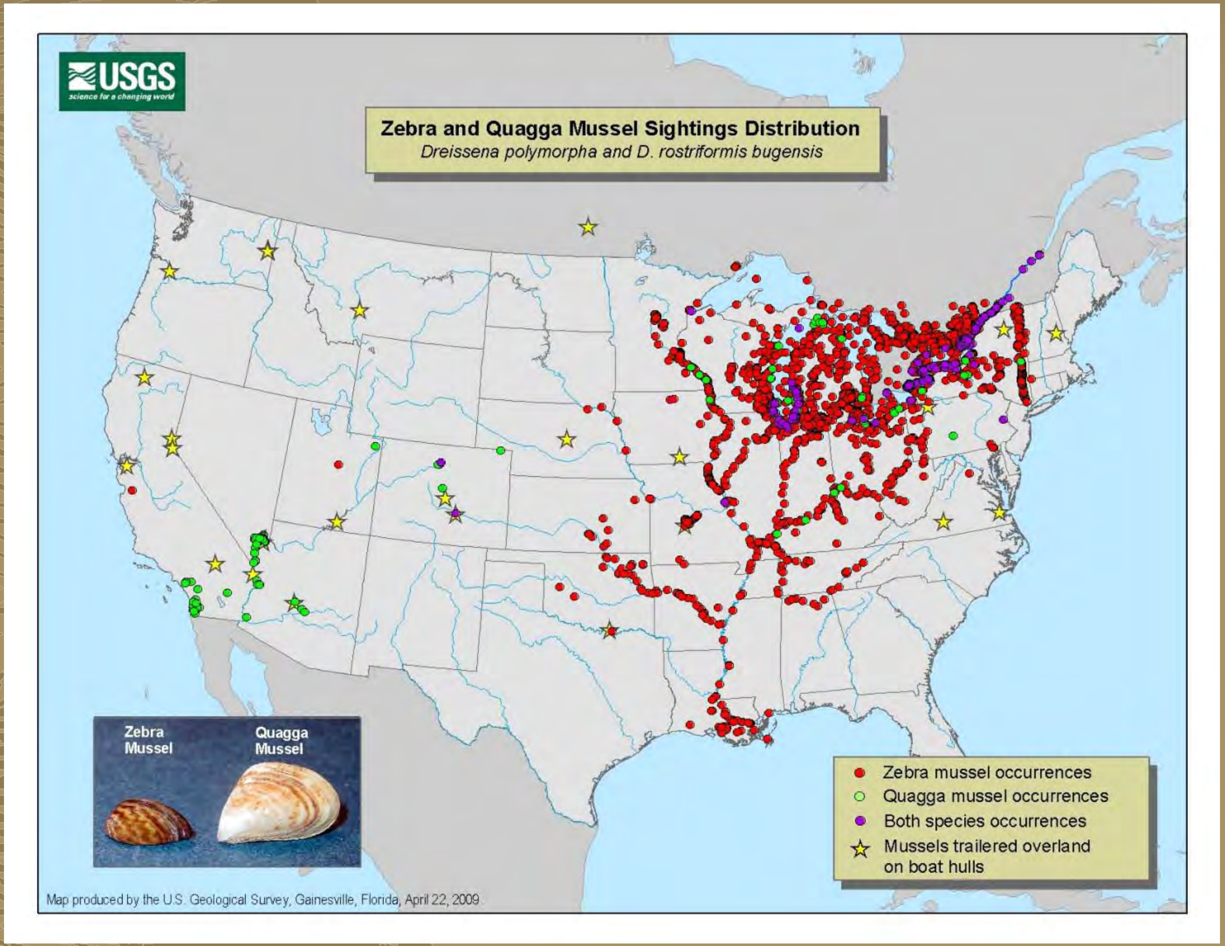
Phase 1 and Phase 2 Standards Implemention Schedule (5 year grandfathering)



If Practicability Review determines Phase 2 Standard is not achievable, but a standard which is more stringent than existing (IMO) is achievable, then that standard will be phased in 3 years following FR publication. Practicability reviews will be conducted every 2 years until full Phase 2 is achieved.

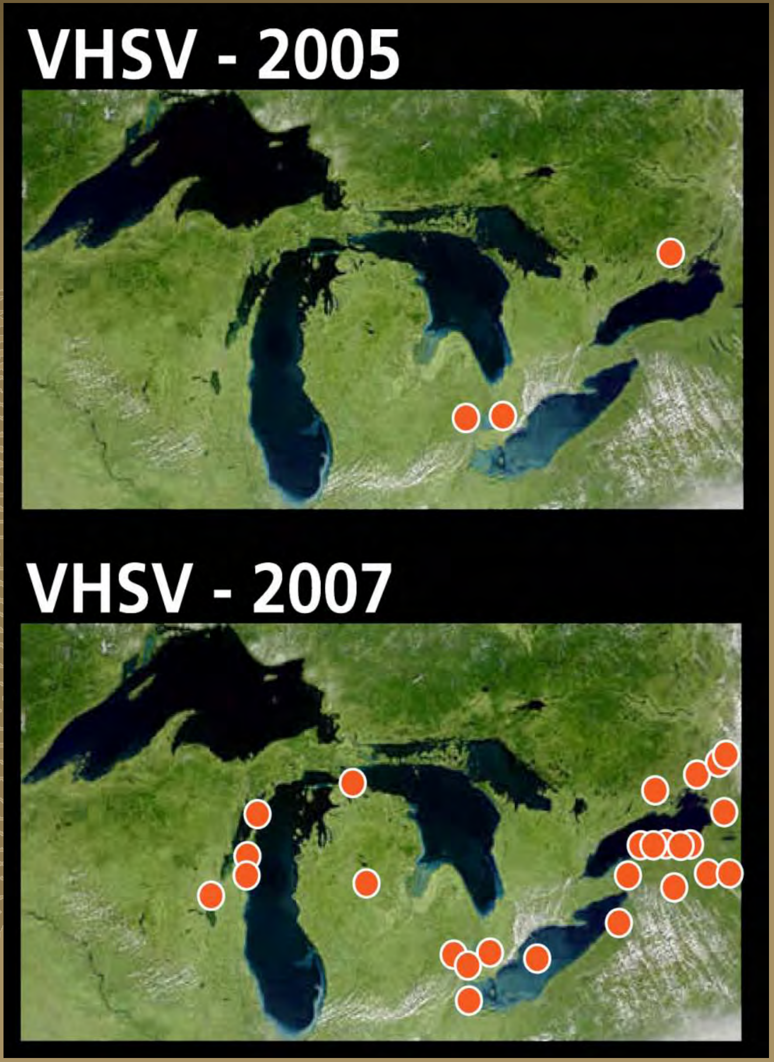
Note: Actual installation dates are the first drydocking after the implementation date which may be up to five years.

National Park Service
U.S. Department of the Interior

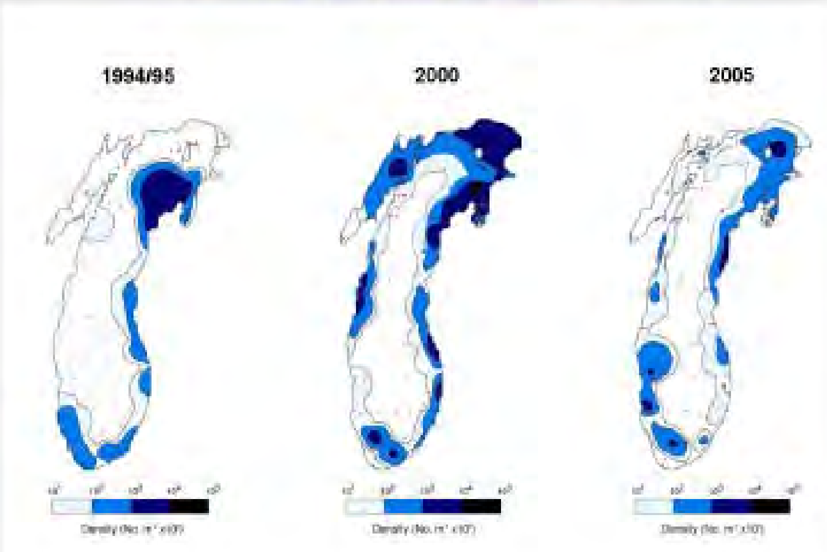


How to slow the spread of Aquatic Invasive Species and protect the Last Great Lake?

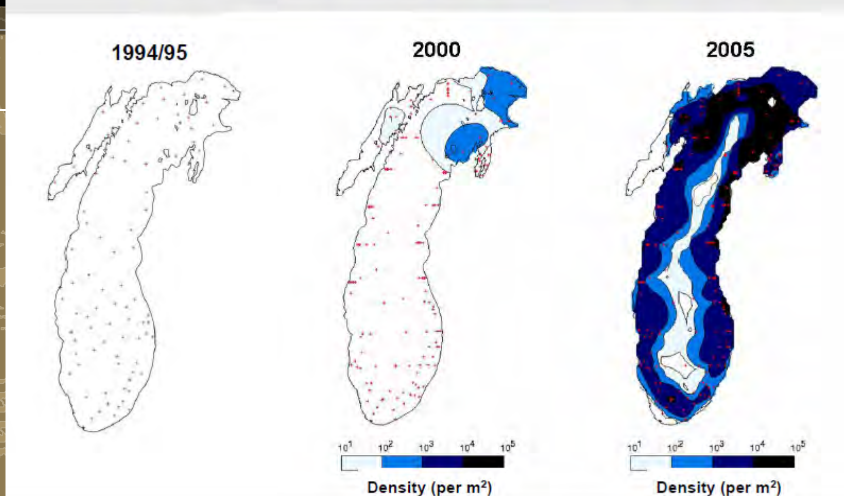
EBBBing the flow of Aquatic Invasive Species : Education, Boats, Bait and Ballast



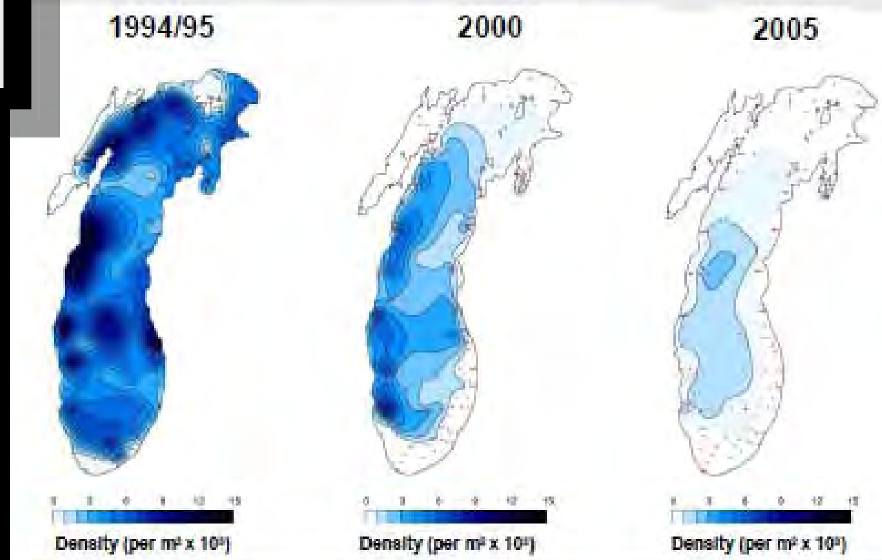
Dreissena polymorpha (zebra mussel)



Dreissena rostriformis bugensis (quagga mussel)



Diporeia Density in Lake Michigan



Condition Factors Near 0.70

0.57

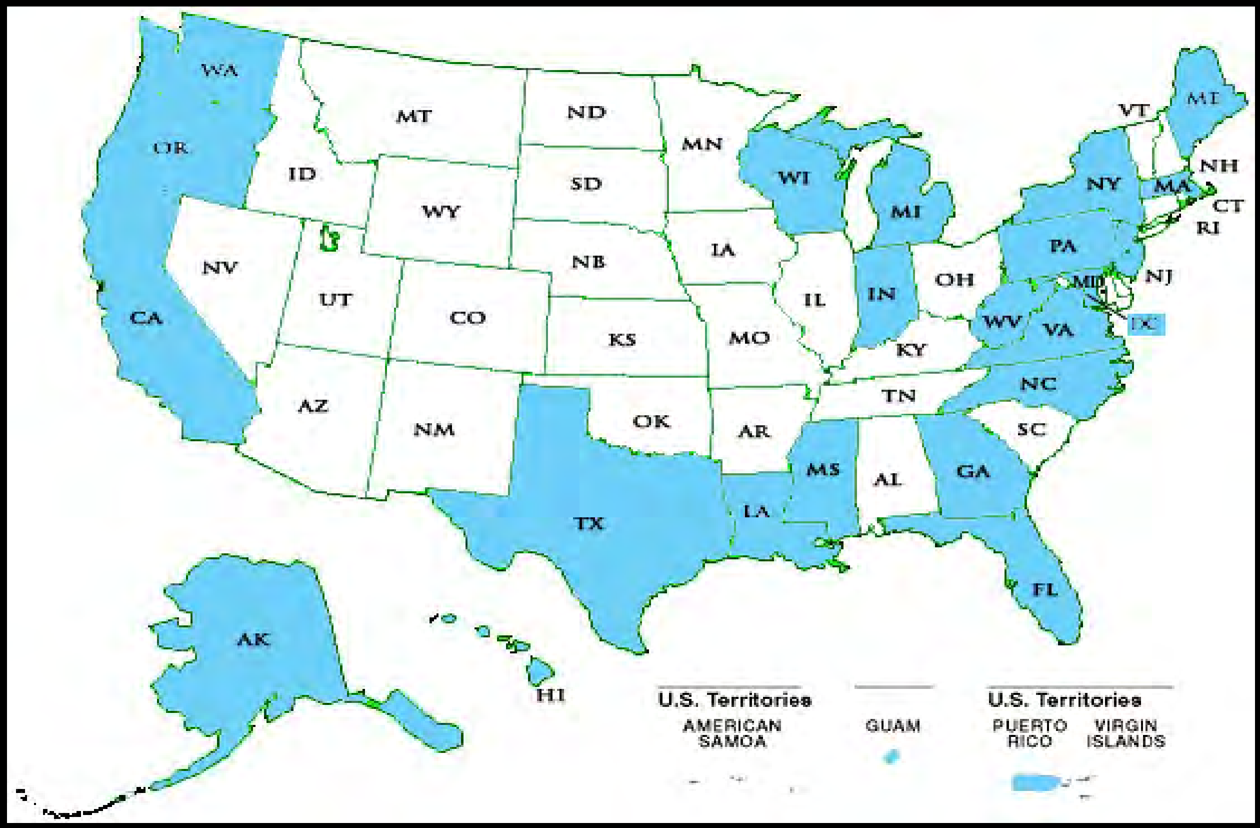
0.63

0.72

National Park Service
U.S. Department of the Interior

Igloo Moon

National Park Service
U.S. Department of the Interior



There are maritime park units located in each blue state.

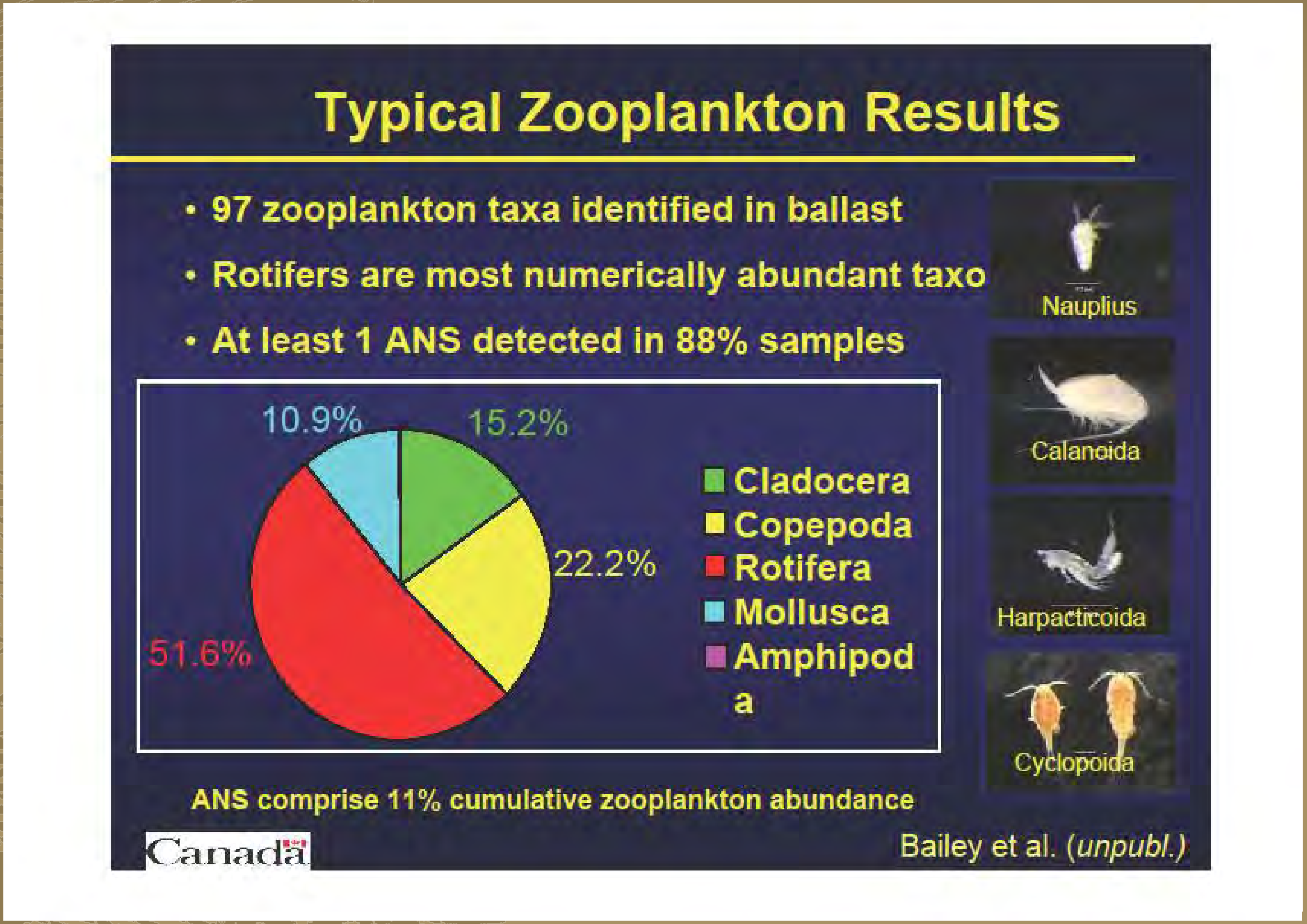
EXPERIENCE YOUR AMERICA

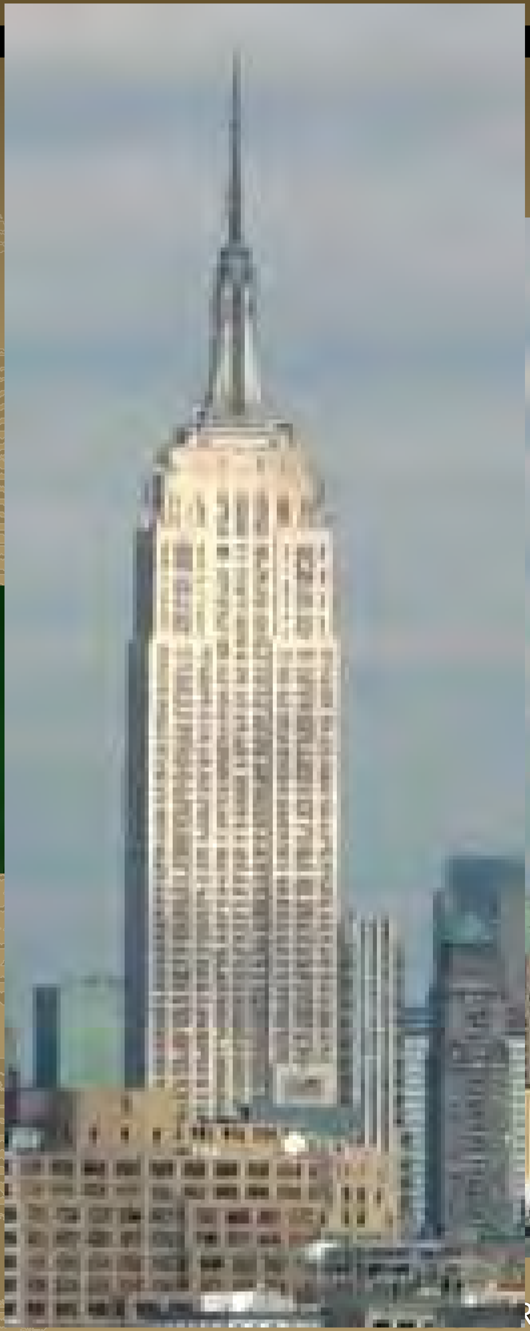
Summary of Non-Native Species Found in Lake Superior or Tributaries (1883-2010)

Taxa	Number of Species	Percent
Aquatic Invertebrates	31	33.3%
Plants*	31	33.3%
Fish	18	19.4%
Fish Diseases and Parasites	13	14.0%
Total	93	100%

Jensen, DA & Gunderson, JL. 2010.
Soon available at www.seagrant.umn.edu

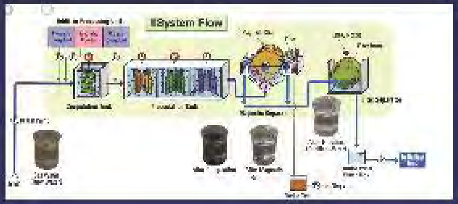
Sea Grant


Typical Zooplankton Results
• 97 zooplankton taxa identified in ballast
• Rotifers are most numerically abundant taxo
• At least 1 ANS detected in 88% samples
10.9%
15.2%
22.2%
51.6%
Cladocera
Copepoda
Rotifera
Mollusca
Amphipod
a
Nauplius
Calanoida
Harpacticoida
Cyclopoida
ANS comprise 11% cumulative zooplankton abundance
Canada
Bailey et al. (unpubl.)



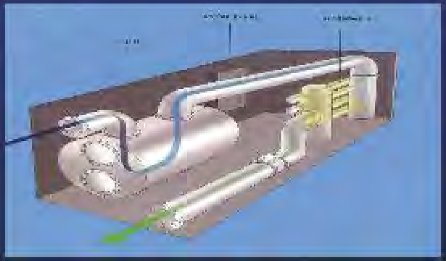
RIENCE YOUR AMERICA

Current Situation

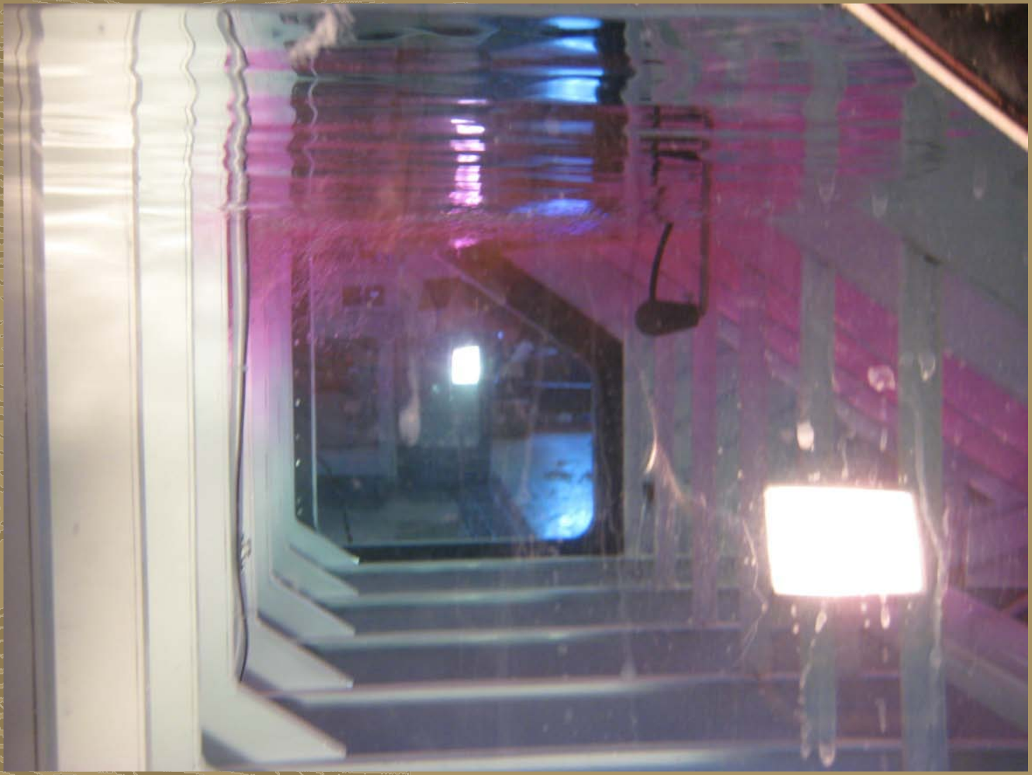


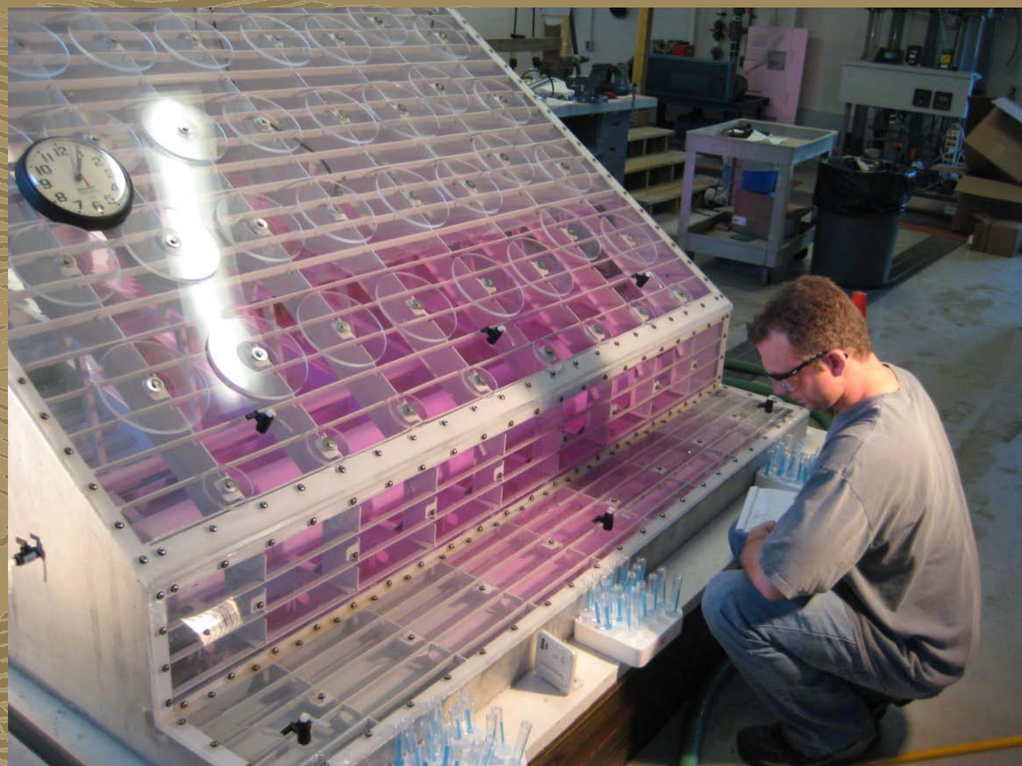
- Final Approvals to date

  8 systems that use active substances
- More Final @ MEPC 60
- GESAMP 2 meetings - 9 more evaluations



- Type Approval to date
- 6 with IMO F/A, 2 without
- Sufficient systems available for 1st implementation date criteria <5000 cu M





Mixing Biocides into Ship's Ballast Water

- BASIC METHODS – USING ONLY "SHIP'S LOCKER" EQUIPMENT
  - Empty Tanks – Fully Mix on Uptake with Inline Dosing
  - Full Tanks – Several "Simple" Methods to Fully Mix in 24 to 48 Hours
  - January 2010 – Published Emergency Treatment Guide
- ADVANCED METHODS – USING AIR LIFT and SPECIAL NOZZLES
  - Full Tanks – Two Methods to Fully Mix in less than 2 Hours
  - 2010 – Emergency Treatment Guide Update (in process)
- EMERGENCY, INTERIM, AND STANDARD (BWT) IMPLICATIONS
  - Emergency Response Methods are Available
  - Skid Based Equipment may be Practical for Interim Treatment
  - In Tank Mixing Methods Could Influence Treatment Solutions
  - Trials to Mix NaOH Into Full Ballast Tanks Underway

2 **The Glosten Associates** ***It is Practical to Mix Full and Empty Ballast Water Tanks***

National Park Service
U.S. Department of the Interior

Emergency Response Guide for Handling Ballast Water to Control Non-Indigenous Species

Prepared for
National Park Service
Isle Royale National Park
Houghton, Michigan

File No. 09019.01
16 September 2009

DRAFT P1

EXPERIENCE YOUR AMERICA

Adaptive Management

To cope with climate change and variability, this Technical Working Group (TWG) is developing an Adaptive Management Strategy that includes a structured, iterative process for reducing uncertainty through long-term monitoring, modelling and assessment. The strategy has two key goals to help inform decision-making:

- 1. to adapt regulation rules in the future as conditions change; and,
- 2. to provide information on climate changes and water levels so that affected interests could adapt their practices and policies.

- Most importantly, the TWG is identifying critical thresholds and system vulnerabilities in order to define coping zones (A=preferred/acceptable zone, B=difficult but can be coped with under current management regimes, C=management would have to be adapted to avoid serious negative consequences) for affected interests and by location. This critical information will help determine when to alter water regulation rules.

From emergency treatment to interim treatment:

- Identify vessels that are discharging ballast that could be defined as "high risk
- Set a "technology standard" easily measured for a set of biocides that can be practically implemented by vessel operators. A "technology Standard" can be described as a target biocide dose that is known to kill a wide variety of ballast organisms.
- Further develop our methods to dose ballast with the chosen biocide and safely discharge it, with willing shipping industry partners.
- Implement on a pilot scale and expand as needed.

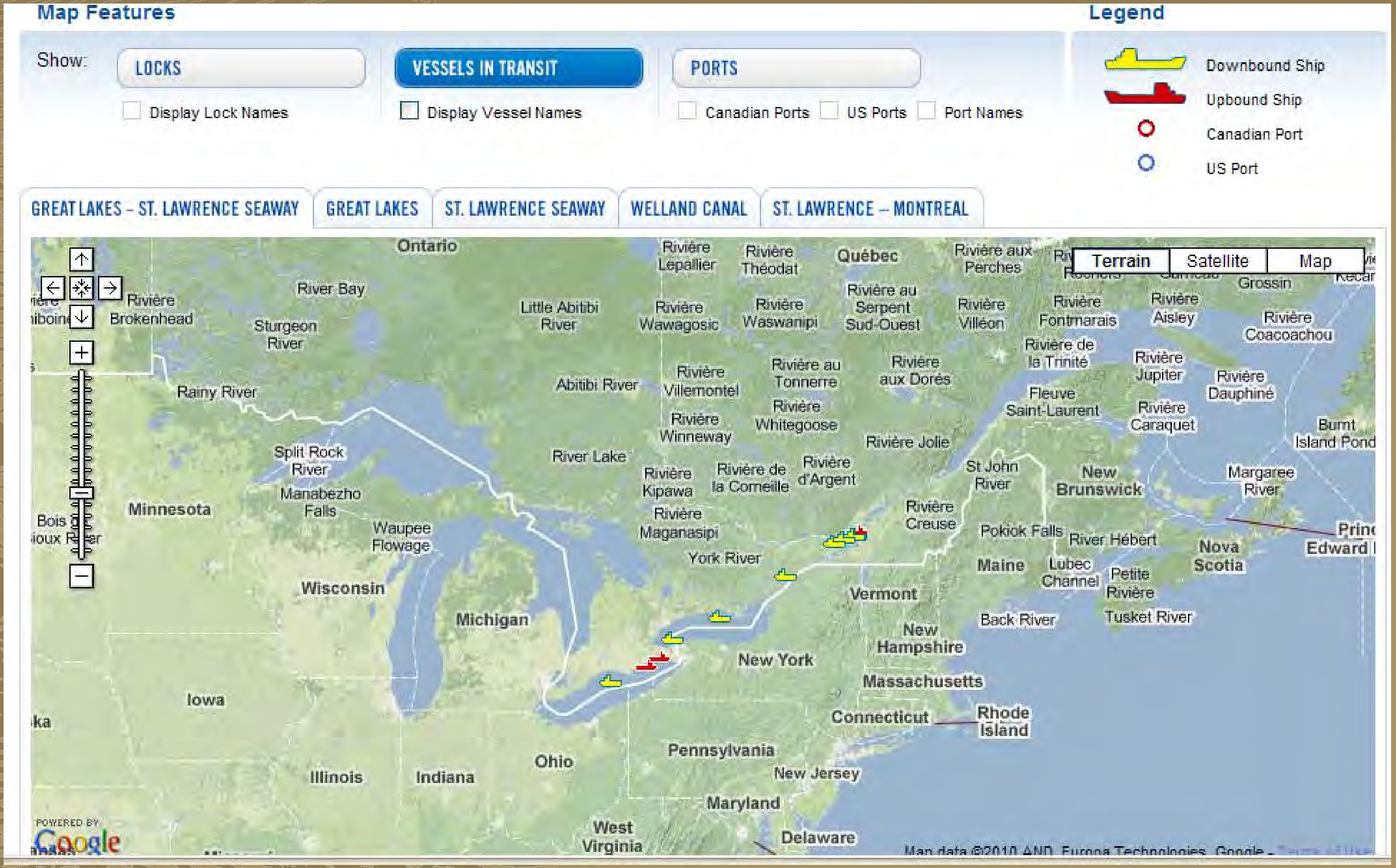
Advantages

- Reduces risk (IE new introductions) in the interim
- May provide the shipping industry with less expensive methods to treat ballast.
- Establishes a measurable "technology standard" that can be reliably implemented until the issues with "biological standards" can be resolved.
- Creates the test platform for evaluating coarse performance measures for compliance and fine performance measures for validation of ballast treatment.

Where to Start?

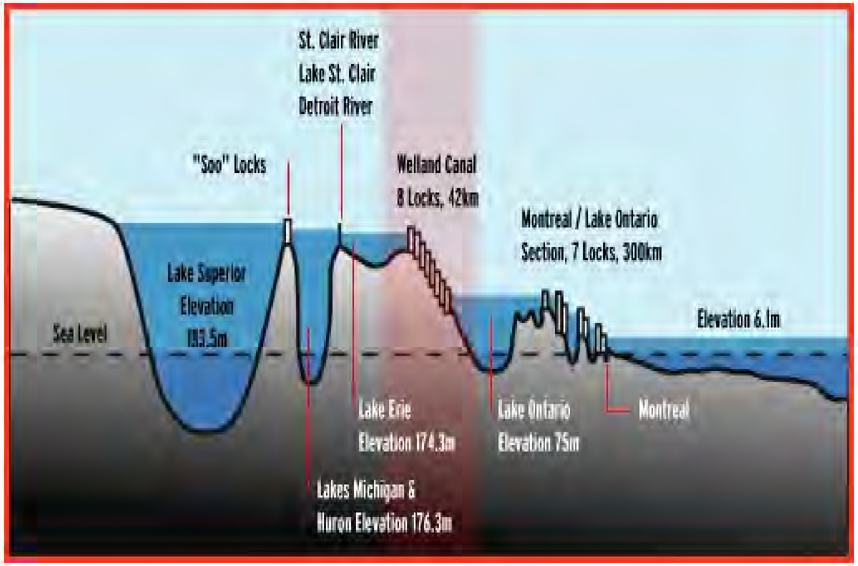
- Discussing options for moving forward.
- Case 1: supporting ecological separation at the Welland Canal
- Case 2: treating high risk ballast at Ports of concern
- Options for shore supported skid mounted interim treatment

Case 1: Supporting ecological separation at the Welland Canal

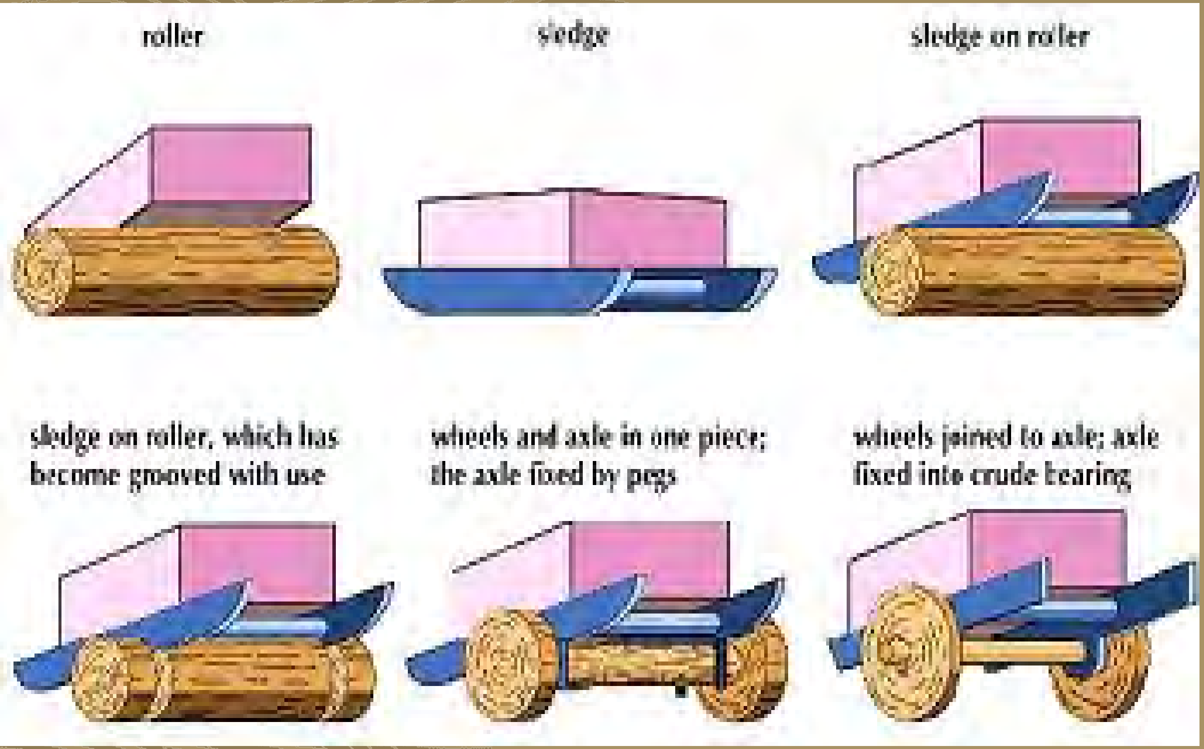

Map Features
Legend
Show:
LOCKS
VESSELS IN TRANSIT
PORTS
Display Lock Names
Display Vessel Names
Canadian Ports
US Ports
Port Names
Downbound Ship
Upbound Ship
Canadian Port
US Port
GREAT LAKES – ST. LAWRENCE SEAWAY
GREAT LAKES
ST. LAWRENCE SEAWAY
WELLAND CANAL
ST. LAWRENCE – MONTREAL
Terrain
Satellite
Map
Ontario
Québec
Minnesota
Wisconsin
Michigan
Iowa
Illinois
Indiana
Ohio
Pennsylvania
New York
Vermont
New Hampshire
Massachusetts
Connecticut
Rhode Island
New Jersey
Maryland
Delaware
West Virginia
Maine
New Brunswick
Nova Scotia
POWERED BY Google

LOCK 8

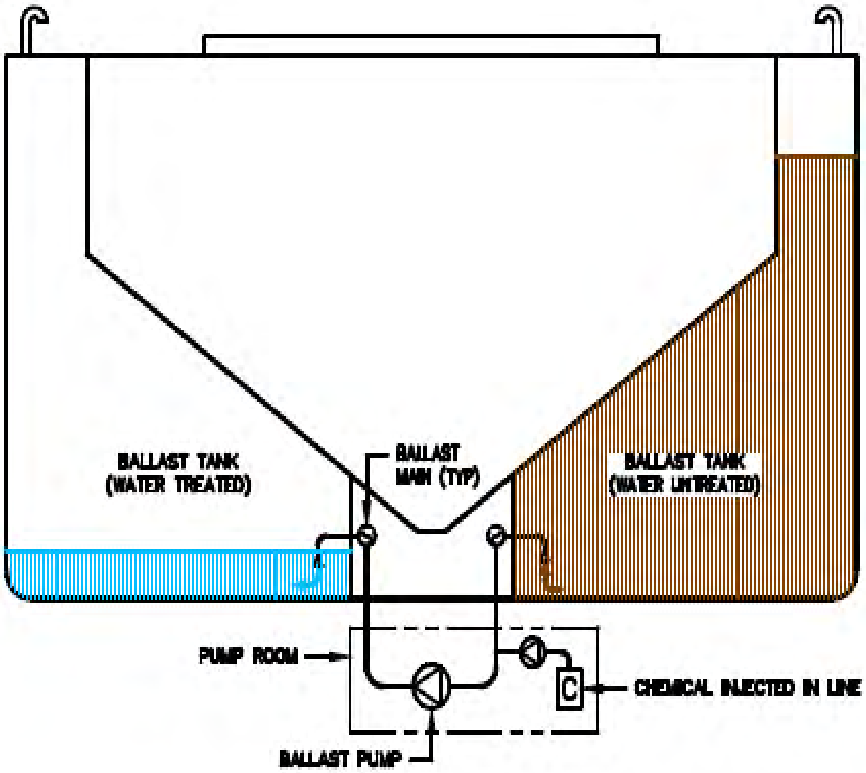
After entering the Welland Canal from Lake Ontario, and transiting the canal's 7 major lift locks, vessels have one transit left to accomplish before entering the waters of Lake Erie. Lock 8 at Port Colborne is a control lock with a shallow lift varying from 0.3 to 1.2 m (1 to 4 feet) to make the final adjustment to the Lake Erie's water level.



Before the wheel: sledges & skids



Basic Mixing Methods -Inline Dosing



Field Trials on Great Lakes Bulker – Goal to Trial Basic Methods

Step 1 – Mix Chemical

Step 2 – Dose One Method

Step 3 through 7 – Dose Again and Again

Field Trials on Great Lakes Bulker – Goal to Trial Basic Methods

Step 8 – Vertical Transects

Step 9 – Discrete Samples

Need for collaboration

- Help develop these options if they might help you find options for a difficult to retro-fit ship.
- Options may need to be developed that focus on individual ships and their routes.
- Other options for biocides need to be developed.
- Communication and collaboration is essential to get rid of AIS hitchhikers

Partnerships

Mixing methods Trials

Investigators:

U.S.Geological Survey – Barnaby Watten and Noah Adams, travis Tucker, and Gary Rutz

- **University of Minnesota – Jay Austin,**
- **Glosten – Jon Markestad, Dan Clopton, and Robin Madsen**
- **National Parks Service – Phyllis Green,**

National Parks of Lake Superior Foundation – Program Management, Field Support

- **NOAA – Funded Phase 1**
- **Great Lakes Fisheries Trust – Funded Phase 2**
- **Legislative-Citizen Commission on Minnesota Resources (LCCMR) – Funded Phase 3**

American Steamship Company – Funded Ship Modifications, Logistics Support, Use of *M/V Indiana Harbor for Test Platform*

Need new Partnerships for solutions for the Last Great Lake, as there is no end to the potential for AIS introductions, only intervention in their arrival.

39

National Park Service
U.S. Department of the Interior

NATIONAL PARK SERVICE

End Program

National Park Service
U.S. Department of the Interior

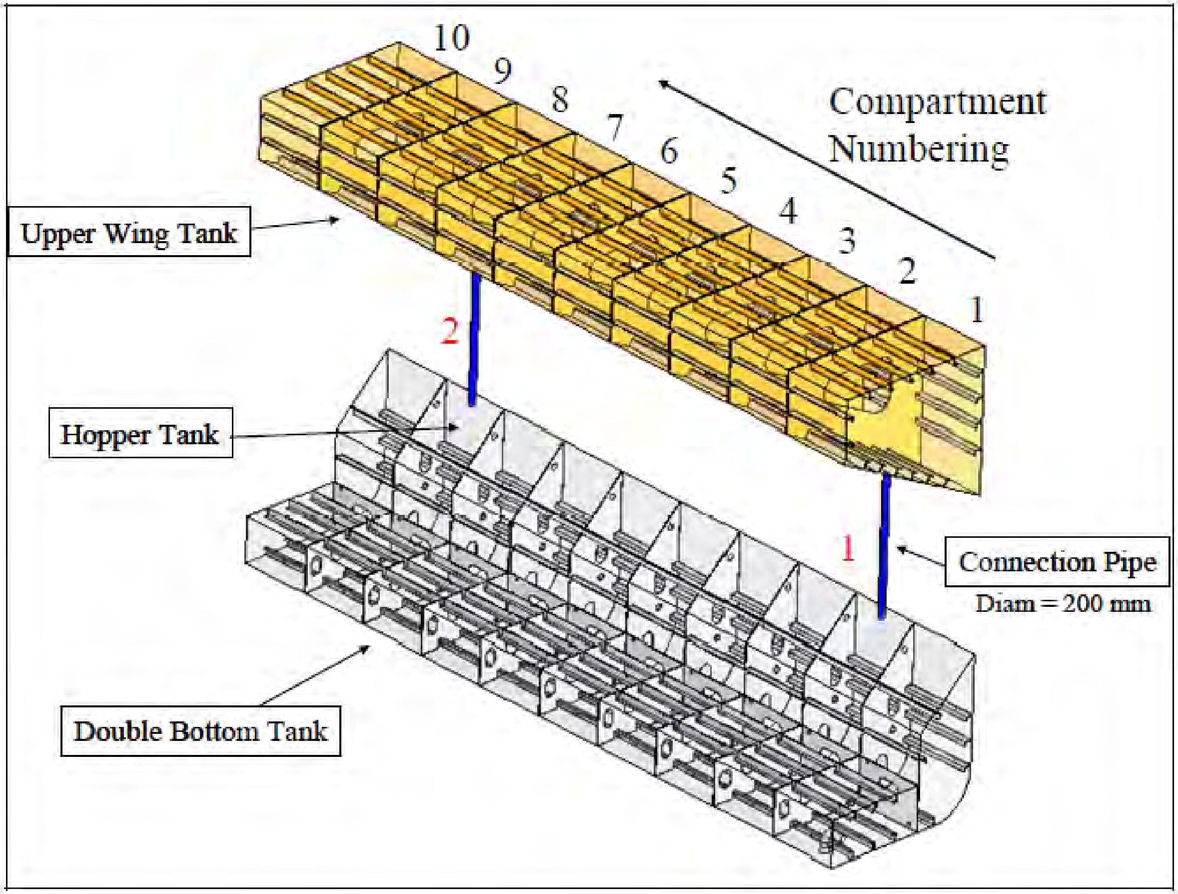


Figure 5. Compartment numbering convention.

DRAFT 4/6/2010

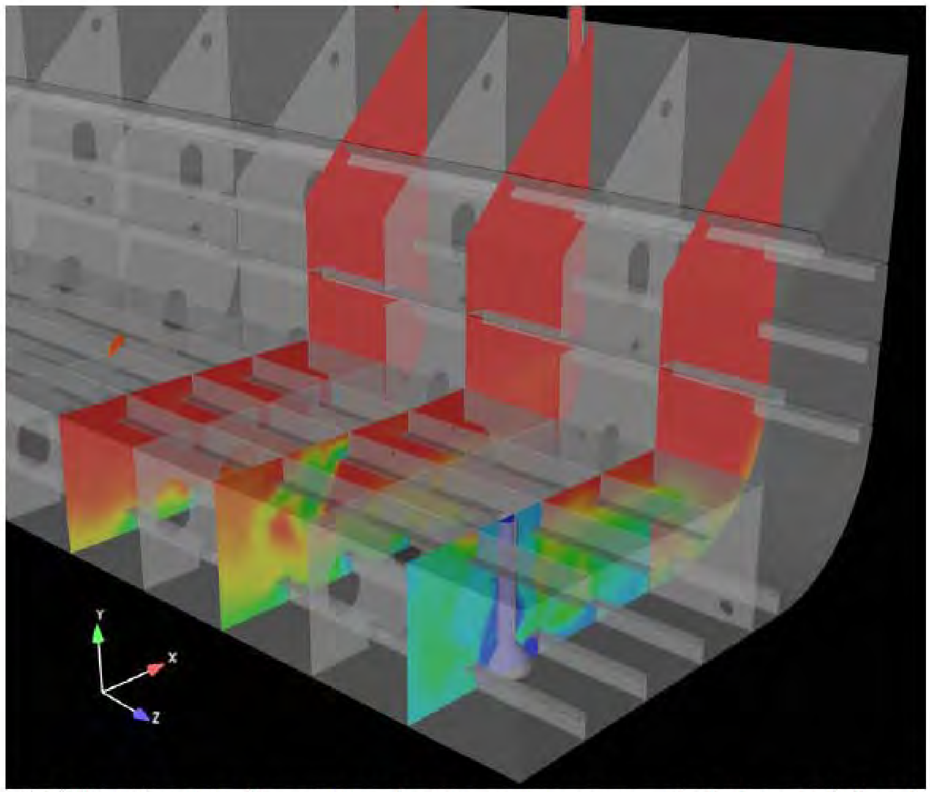


Figure 2: Volume fraction of incoming salt water contours in specified planes in full-scale ballast tank (red = pure resident fresh water, blue = incoming salt water).